INTRODUCTION
It is a universal truth that new times require new measures and this is nowhere else better demonstrated than in many phases of geographical research. One such phase is Medical Geography, a recent addition to the systematic branches of the subject, standing at the border-line between geography and medicine. The problem selected for study belongs to this new field. Medical Geography is the study of the relationship between the pathological factors which cause diseases and the geographical factors which give rise to the pathological factors. Jacques M. May calls the pathological factors "pathogens". It is a well-known fact that disease is a multiple phenomenon and occurs only if various factors coincide in time and space. Medical Geography studies these various factors with their respective geographical environments. The aim of Medical Geography is to find out the main geographical factors which are responsible for the areal distribution of diseases and of health conditions. Medical Geography can thus be defined as a study dealing with the geographical arrangement of diseases and with the factors relevant to the incidence and spread of diseases.

Disease is the outcome of the maladjustment of the biological process with the natural and the cultural environment, so that the natural and cultural environment in which people live and

their dietary habits become the main factors for the type of diseases which they suffer from. Thus the systematic study of the spatial distribution of diseases with reference to the environment in which the diseased persons live, and of their dietary habits forms the main approach of the field of Medical Geography. In short, one could say that in Medical Geography two aspects are studied together: (i) geographical distribution of diseases and (ii) their relationship with the relevant factors in the incidence and spread of diseases (particularly, those factors of the environment in which human beings live).

In the present days of specialization, Medical Geography represents a new combination of two sciences and such a cross-fertilization of knowledge is a unique species for study and will be used for research work in both the fields as far as future public health planning of the country is concerned. Interestingly the medical profession as such is not yet quite familiar with the geographical aspects in the study of diseases, with the result that newer and more complicated diseases emerge before the other older ones are eradicated particularly those which occur due to 'misuse' of our environment and the after-effects of medicine. But environment has always been considered to be of secondary importance. We would be able to destroy the route of the diseases, if we know the actual geographical causes which are responsible for the occurrence of diseases in any area. In the words of the late Professor L. Dudley Stamp: "If the distribution of the incidence of human diseases and their causative factors has been seriously neglected, the comparable
study of human health and of the factors which favour a healthy life has been almost completely ignored.  

But the importance of this new field is not being realised for purposes of research especially in our country, where thousands of people die of many diseases, the causes of which are still obscure. In the absence of any research during the last several decades, no substantial contributions have yet been made in the field of Medical Geography in India. However, research in this field has recently been started and the author would like to believe that cooperation of geomedical study and preventive medical aid will be of great advantage to the human society as well as for the field of scientific research.

GEOGRAPHY AND DISEASE

Geography could now be included among those disciplines which study human diseases, in one form or the other. Various geographical factors affect and sometimes even determine the disease-incidence and reproductive capacity of the human being.

The air, water and land of certain places are more suited for human habitation, while physical and economic geographical conditions determine the availability of food on which the resistance power of the body depends, malnutrition reduces

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resistance power which creates a favourable environment for disease occurrence. The type of natural and cultural environment that surrounds the people and what they eat for their nutritional needs have therefore much to do with the types of diseases which they suffer from.

Causes of polluted environment and its modification are also significant aspects that come under the discipline of Medical Geography. Here the relationship between man's physiology and the environment in which he lives, is studied with a view to find out the ideal environment in which he can lead a healthy life. The actual aim of Medical Geography is the study of the geographical environment, in which a person lives. It is not the study of the disease itself, but of the area affected by various diseases, and their distribution within particular regions.

According to Yevgeiniy I. Ignat'yev and his associates, the various views regarding this subject can be grouped into three basic stands:

1 Medical Geography deals with the distribution of human diseases and conditions under which they arise.

2 Medical Geography deals with the effect of natural conditions on the health of man.

3 The object of Medical Geography is to study the geographical environment of human society and its influence on the health of Man.

DEVELOPMENT OF MEDICAL GEOGRAPHY

In western countries the earliest literature in this field goes back to the Hippocratic accumulation of Greek philosophers. During the seventeenth and eighteenth centuries further progress was made when a number of books on Medical Geography and connected topics were written. Among these, Finke, a German clinician, accumulated a large collection of data of his travels and published three volumes and named them as Medical Geography. In the recent past considerable work has been done in the U.K., the U.S.A., the U.S.S.R. and Germany.

The most important work in this field is that by Jacques M. May, who has published several papers. In particular, his paper "Medical Geography, its methods and objectives" has become a starting point for researchers. His studies in Medical Geography have been published in three volumes, viz:


Other recent works are Stamp's books "Some aspects of Medical Geography" and "The Geography of life and Death". A.T.A. Learmonth has also done significant work in this field, he is

also chairman of the Standing Commission on Medical Geography of the International Geographical Union. Under the auspices of this commission a Newsletter is being published and attempts are also being made to create journals of Medical Geography on an international basis. Some important aspects have also been discussed at the 23rd International Geographical Congress at Moscow (1976) for further development.

In India pioneer work has been done by R. P. Misra who had written a reference book "Medical Geography of India" which also has become a starting point for researchers. Professor Learmonth has also written several papers on Medical Geography in various Indian journals. In our country Medical Geography is still in its infancy, but much good work is already being done in some Universities, particularly at Aligarh, Banaras Hindu University, Calcutta, Jodhpur, Mysore, Rajasthan and Saugar, from where research papers are being published from time to time.

AREA OF STUDY

The geomedical unit of study lies between 22° 30' N. and 25° 10' N. Latitude and 76° 25' E. and 79° 10' E. Longitude, lying almost in the heart of the State of Madhya Pradesh. It comprises an area of 2,842,499 km² and a population of 34,31,631 (1971). The study unit includes some or entire part of Bhopal, Guna, Raisen,

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Sagar, Sehore, Shivpuri, and Vidisha districts of the State (Plate No. 2). The area chosen forms the eastern half of that part of Madhya Pradesh which is covered by Deccan trap lava. However, the exact boundaries of this geological formation have not been considered, but such Primary Health Centres* have been included whose larger portions fall within the trap area. Trap areas outside the State have also not been considered.

SOURCES OF DATA

DISEASE DATA

The disease data were collected from Primary Health Centres as well as from other government hospitals of the area under study, where all the reported cases are compiled according to the International Classification of Diseases. Data of all the prevalent diseases for the years 1969, 1970 and 1971 were collected for all the centres.

Besides these data, due to the fact that about 50 per cent of the patients visited private hospitals, a disease survey was also conducted, in which several private doctors of urban as well as rural areas were interviewed and all possible information on the nature and type of patients, their diseases etc. was collected.

* Each tahsil consists of one or more Primary Health Centres, the lowest administrative unit of the Directorate of Health Services.
During the diet survey, general diseases of the family and the previous medical background of the respective families were also noted, because some people never went to a hospital or they were treated by locally available medicines or by local quacks boasting of super-natural powers. In this way information on the prevalent diseases was collected through three sources:

(i) Government sources
(ii) Disease survey (Appendix 6 A)
(iii) Diet survey (Appendix 4 A)

Nutritional Status of the People: To work out the nutritional status of the people, a diet survey through the oral questionnaire method was conducted in the entire region, in both urban as well as rural places. The method of selecting the villages and towns, the techniques used etc. will be discussed in the concerned chapter.

Population: Population figures have been collected from "Census of India 1971, Series 10 Madhya Pradesh" as well as from P.H.Cs.

Climatological data have been collected from the concerned Memoirs of the India Meteorological Department and were also received through personal correspondence. Data on agriculture were collected from publications of the State Department of Agriculture.

Besides these, a considerable quantity of literature had been received from and/or the author consulted: the World Health
Organization, Geneva, the National Institute of Nutrition, Hyderabad, the Library of the Indian Council of Medical Research, New Delhi and the Gandhi Medical College, Bhopal. Besides these, several books and journals of geography, biology, general science and medicine were also consulted.

PLAN OF THE WORK

The plan of the work is as follows. The first Chapter titled as the Physical Environment deals with the physiography, climate, geology, soils and drainage system of the geomedical unit, while in the second Chapter various cultural aspects of the environment in which people live and their direct and indirect effects on the disease-incidence, such as population distribution, sex-ratio, educational level, agriculture, industries, settlements, modes of life, sanitation and concept of treatment have been discussed.

In the third Chapter, important aspects of the surrounding environment where Man is involved as a factor have been discussed, these have a direct effect on the prevalence of disease in the area. These aspects are: different types of pollutants, solid waste disposal facilities, drainage system, ignorance and poverty. Also, the cultural and social aspects of the various communities of the region are discussed in this chapter.

In the fourth Chapter, dietary habits, elements of a balanced diet, importance of diet survey, factors which determine
the dietary habits, nutritive value of foods, cooking and wastage, effects of social beliefs on nutritional status and nutrients required in different physiological conditions are discussed thoroughly.

The fifth chapter concerns the most important part of the study as far as deficiency is concerned, viz. a detailed analysis of the diet survey and nutrient-intake by the people of the area. This has been divided into three groups: (i) diet analysis and nutrient-intake of the urban people, (ii) diet analysis and nutrient-intake of the rural people, and (iii) malnutrition and under-nutrition (combined study of both urban and rural areas).

Chapter six deals with the classification of diseases, pattern of diseases, intensity of diseases and ranking of diseases of the region. Chapters Seven and Eight deal with the subject, forming the title of the thesis, viz. Environmental Diseases and Nutritional Deficiency Diseases. In Chapter Seven major environmental diseases of the region have been discussed with their distributional pattern, their ranking etc. with respective causative agents of the environment of the region where people live, which are responsible for the incidence of these diseases or which make the environment favourable for disease-occurrence. In Chapter Eight, the major nutritional deficiency diseases have been discussed thoroughly with their distribution. Deficiency diseases have also been correlated with the prevalent dietary habits of people and their nutritional
status on the basis of the results of the diet survey. It may be remembered here that various aspects of nutritional deficiency have already been dealt with in earlier Chapters. In the last Chapter which is the concluding part of the thesis, the author has briefly summarised the main factors of the environment in which people live and how the nutritional status which they get from their diet could be correlated with the prevalent diseases. Besides, in terms of the available medical facilities, suggestion for better health planning and further scope for research have also been discussed.

DEGREE OF ORIGINALITY OF THE Work: The author would like to submit here that the registration of deficiency diseases in the government hospitals is not properly done, they are all compiled into one group, so nutrient-wise deficiency diseases are not detected easily on the basis of these data alone. On the other hand, private doctors have no proper records of the number and types of patients who visit them. The author has thus preference to use the records of P.H.C.s. as well as other hospitals and the information supplied by private doctors regarding the prevalent diseases. As far as nutritional status of the people is concerned, information which was collected through interview in the field has been accepted as correct.

Besides the above, except for the fundamental ideas regarding disease pathology, etiology, nutritional status and other related aspects, all other work discussed in the text is the author's own.